

Determinants of individual engagement in knowledge sharing

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Abstract Knowledge management systems try to elicit and support the flow of ideas and experiences among groups of employees (sometimes referred to as knowledge communities). Whereas numerous information and communication systems have been developed to support such knowledge exchanges, practical applications have found that technology alone cannot ensure that knowledge will indeed be volunteered and exchanged, and whereas researchers and consultants alike have argued that culture and other human variables constitute key success factors, it is not clear what specific variables are at play, nor what management practices can affect those variables. This exploratory research investigates some of the psychological, organizational and system-related variables that may determine individual engagement in intra-organizational knowledge sharing. Results from a survey of 372 employees from a large multinational show that self-efficacy, openness to experience, perceived support from colleagues and supervisors and, to a lesser extent, organizational commitment, job autonomy, perceptions about the availability and quality of knowledge management systems, and perceptions of rewards associated with sharing knowledge, significantly predicted self-reports of participation in knowledge exchange.

Keywords Knowledge management; knowledge management systems; knowledge sharing; personality; self-efficacy; openness to experience; perceived support from colleagues and supervisors; organizational commitment; job autonomy; perceptions of rewards.

Current accounts of organizations view *knowledge* as a potential source of competitive advantage (Boisot, 1998; Spender, 1996a, 1996b; Spender and Grant, 1996; Cabrera and Allen, 1999). Organizational knowledge is valuable, scarce, path dependent, causally ambiguous, and hard to imitate and substitute by third parties (Wernerfelt, 1984; Nanda, 1996). Knowledge is thus a highly strategic asset and, as such, deserves the attention of specific managerial interventions (Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995). In the last few years, numerous companies have invested in what has been referred to as *knowledge management systems*. That is, initiatives that include new information systems (Davenport *et al.*, 1998), new organizational structures (Wenger and Snyder, 1999; Moore and Birkinshaw, 1998); or new human resource policies (Davenport and Prusak, 1998) designed with the main purpose of leveraging the collective knowledge of

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employees (Davenport and Prusak, 1998; Davenport *et al.*, 1998; Hansen *et al.*, 1999; Quinn *et al.*, 1996). According to one recent industry survey (KPMG, 2000), 62 per cent of leading organizations in Europe and the USA reported to be using or setting up some kind of knowledge management system.

In practice, information technology seems to be the main driving force, with knowledge management projects being five times more likely to be led and funded by the IT Department than by its Human Resource counterpart (KPMG, 2000). The new information and communication technologies have made possible the interconnection of a company's employees across time and space barriers, the exchange of information in all forms and media, and the management of rich, large-scale repositories of shared information. The exchange of information may in fact be one of the major requirements for creating and leveraging collective knowledge (Nahapiet and Ghoshal, 1998), and it is precisely on those processes that information technology can have the greatest impact.

Many knowledge management initiatives take the form of what has been referred to as a 'knowledge repository' (Davenport and Prusak, 1998) or a 'discretionary database' (Connolly and Thorn, 1990). A knowledge repository allows employees in an organization to exchange experiences, work methods, improvement ideas and market hints by posting documents onto a database that is accessible to all members of a group. The group of employees that is granted access to the repository forms a type of organizational structure – a *community of practice* (Wenger and Snyder, 1999) – that cuts across standard product, functional, or geographical divisions. Contributions to the knowledge repository are in most cases considered voluntary, as it would be nearly impossible for the organization to monitor when an employee has had a valuable idea that would be worth sharing. At the same time, because the organization seeks to maximize the distribution of new ideas, each member of the community is normally given free access to the contributions made by others irrespective of whether or not or how much he or she may have contributed in the past.

Knowledge repositories can play an important role in facilitating knowledge flows within the organization. However, the repositories cannot guarantee by themselves that the knowledge exchanges will in fact take place (Davenport and Prusak, 1998; Connolly and Thorn, 1990; Kalman, 1999). When managers were asked by KPMG (2000) about the major barriers they were facing in implementing knowledge management systems, most answers had to do with people (lack of understanding of benefits, lack of communication, lack of time to participate, incompatibility with current jobs, lack of training) rather than with technology. No matter how sophisticated, information systems can at the very best solve just part of the problem. As Davenport and Prusak (1998) put it, 'effective knowledge management cannot take place without extensive behavioral, cultural and organizational change.... Technology alone won't make a person with expertise share with others. Technology alone won't get an employee who is uninterested in seeking knowledge to hop onto a keyboard and searching or browsing' (pp. 141–2).

One of the reasons why knowledge repositories may not necessarily create the sharing dynamics that they intend to produce has to do with the perverse reward contingencies that they set up, according to which people may be better off hoarding, rather than sharing, what they know (Cabrera and Cabrera, 2005). Connolly and his colleagues (Connolly and Thorn, 1990; Connolly *et al.*, 1992) have suggested that organizational knowledge repositories set up the conditions of a *public good social dilemma*. A public good (e.g. public television, a public park) represents a shared resource that is provided by the joint contributions of some members of a community but is available to everyone regardless of whether or not they contributed to its provision. The reward structure of a public good creates an incentive for individuals to free ride on the contributions of others.

At the aggregate level, this can lead to a costly undersupply of the shared resource. Following a public-good logic, the results of Connolly *et al.*'s (1990, 1992) experiments illustrate how the payoff structure as well as the context in which knowledge transactions take place may have an important impact on the successful provision of organizational knowledge repositories.

Under the impossibility of controlling and enforcing knowledge sharing, organizations face the challenge of finding ways to encourage employees to share their knowledge with one another. Prior research suggests that psychological variables such as self-efficacy, organizational commitment, or perceived instrumentality may have a significant impact on people's inclination to participate in voluntary knowledge sharing (Kalman, 1999). Our paper expands on this line of research by focusing on a number of psychological and organizational variables that may explain part of the variance among individuals in terms of participation in knowledge sharing. Based on the results of our study, the paper also tries to identify managerial interventions that can foster knowledge sharing within an organization. This exploratory study focuses on individual variables (i.e. personality, self-efficacy, and organizational commitment) individual perceptions of how the organization is managed (i.e. job autonomy, rewards associated with knowledge sharing and perceived support from co-workers and supervisors) and individual perceptions about existing knowledge management systems (i.e. availability and quality of the systems). To investigate the possible effects of each of these variables on knowledge sharing, we collected survey data in a large multinational in the information technology and services industry.

In the next section we discuss one by one each of the variables that were included in the study and the theoretical reasons why they were expected to be related to knowledge sharing. Then the methodology of the study and the results are presented. Finally, we discuss the implications of our findings for effective knowledge management and indicate some lines of future research.

Psychological determinants of knowledge sharing

The main goal of this study is to investigate a subset of variables to explore their relationships with an individual's likelihood of engaging in knowledge sharing behaviours. As a result of the lack of prior research related to this topic, the subset of variables we chose were based on research into dependent variables or behavioural outcomes conceptually similar to knowledge sharing at work.

Personality

Recent research has shown that personality measures are linked to important organizational outcomes including job performance, training success, team functioning, sales, turnover, self-ratings of performance, promotability, compensation, career development, and leadership efficacy (Barrick *et al.*, 2001; Mount *et al.*, 1998; Judge *et al.*, 1999a; Judge and Bono, 2000; Salgado, 1997, 2000). Given such precedents, we wanted to explore whether personality could also account for some of the variance observed in participation in knowledge sharing.

In the last ten years, the five factor model (FFM) of personality has been increasingly considered as a taxonomic framework to organize the findings in the areas of organizational behaviour in which personality measures are implicated. The FFM considers that five broad personality factors adequately summarize the domain of normal adult personality. A large body of literature has accumulated in the past two decades providing compelling evidence for the robustness of the FFM. Researchers have replicated

the five factor structure using different measurement instruments, with different factorial techniques (Goldberg, 1990; 1992); in different cultures; with different languages (e.g. English, Spanish, Finnish, German, Japanese, Chinese, French, Italian, Portuguese); using ratings obtained from different sources and with a variety of samples (e.g. Digman and Takemoto-Chock, 1991; Fiske, 1949; McCrae and Costa, 1987; Norman, 1963; Norman and Goldberg, 1966; Watson, 1989). The five personality dimensions included in the FFM are emotional stability (versus neuroticism), extroversion (versus introversion), openness to experience (versus closeness to experience), agreeableness (versus rudeness) and conscientiousness (versus non dependability). Emotional stability characterizes individuals as stable, controlled and secure versus depressed, anxious, insecure and unstable. Extroverted individuals are defined by others as sociable, talkative, and assertive, at the positive pole, and retired, silent, and reserved at the negative pole. Openness to experience is linked to traits such as imaginability, curiosity, artistic sensitivity and originality, as opposed to conventionalism. An individual defined as agreeable is seen by others as cooperative, cheerful and supportive, as opposed to rude, aggressive and antagonist. Lastly, conscientious individuals are defined as reliable, dependable, industrious, achievement oriented and organized.

From these five dimensions we hypothesized that three of them would be related to knowledge sharing behaviour: agreeableness, conscientiousness and openness to experience. Since agreeable individuals are defined as cooperative and supportive, we expected them to be more inclined to respond to requests for knowledge and even volunteer their ideas to others. Conscientiousness, on the other hand, may be related to both volunteering and seeking other people's knowledge inasmuch as employees perceive these behaviours to be an important part of their duties. Finally, openness to experience, as a reflection of an individual's curiosity and originality could be a predictor of seeking other people's insights.

Based on the definition of the Big Five personality dimensions and the empirical findings relating to personality and organizational behaviours and attitudes cited above, we stated the following hypotheses:

Hypothesis 1: There will be a positive correlation between agreeableness and knowledge sharing.

Hypothesis 2: There will be a positive correlation between conscientiousness and knowledge sharing.

Hypothesis 3: There will be a positive correlation between openness to experience and knowledge sharing.

Organizational commitment

Organizational commitment has become a topic of increasing importance in human resources and organizational behaviour areas and some authors claim that it may be an important component of an organization's intellectual capital (Ulrich, 1998). O'Reilly and Chatman (1986) define organizational commitment as the level and type of psychological attachment an employee has to an organization. Similar to other researchers (e.g. Allen and Meyer, 1990; Kelman, 1958; Mowday *et al.*, 1982), O'Reilly and Chatman (1986) divide organizational commitment into three conceptually different dimensions of attachment: compliance, identification and internalization. The internalization component of OC refers to the congruence between the values of the employee and the values of the organization. The identification component refers to commitment based on the desire of the employee to be affiliated with the organization.

Finally, the normative component refers to employees' involvement based on the acquisition of specific extrinsic rewards. Organizational commitment has been found to be related to relevant organizational variables, including turnover, job satisfaction, sense of obligation and helping others (Meyer *et al.*, 1993; O'Reilly and Chatman, 1986).

Even though the three components of OC may be related to knowledge sharing in organizations, the results by O'Reilly and Chatman (1986) with respect to extra role prosocial behaviour and Kalman (1999) with respect to knowledge sharing, lead us to speculate that participation in knowledge sharing will be especially sensitive to the level of an employee's internalization attachment.

Based on the prior work relating organizational commitment with other relevant organizational behaviours and attitudes (e.g. turnover, tenure, job satisfaction), we stated the following hypothesis:

Hypothesis 4: Individuals who show greater levels of internalization (i.e. value-based commitment) to their organization will be more likely to engage in knowledge sharing.

Role breadth self-efficacy

The concept of self-efficacy represents a 'judgement of one's capability to accomplish a certain level of performance' (Bandura, 1986, p. 391). An extensive line of research by Bandura and many others has demonstrated that a person's inclination to engage in a specific course of action (task effort, persistence, expressed interest and level of goal difficulty) is heavily influenced by the person's sense of self-efficacy (Bandura, 1997; Gist, 1987; Gist and Mitchell, 1992). Social psychologists have found a relation between self-efficacy and behavioural results in a number of applied areas (see Bandura, 1997, for a review).

A meta-analysis by Stajkovic and Luthan (1998) found that self-efficacy showed a correlation of .38 with a criterion of general work performance. Another meta-analysis by Salgado and Moscoso (2000), considering other organizational criteria, found a validity of .39 for predicting job performance ratings by supervisors, a validity of .41 for predicting job performance self-evaluations, a validity of .25 for predicting wages, .26 for predicting job satisfaction, .26 for predicting education and training, and .18 for predicting absenteeism (actually lack thereof). In general, self-efficacy beliefs are therefore good predictors of a number of organizational behaviours and attitudes.

Some recent research investigating self-efficacy has focused the concept on tasks that go beyond the specified requirements of jobs and instead include proactive interpersonal and integrative tasks beyond technical requirements. This incarnation of self-efficacy is referred to as role breadth self-efficacy (RBSE; Parker, 1998; Parker and Sprigg, 1999; Parker, 2000). RBSE has been designed to measure an employee's self-efficacy within 'a flexible, self-directed, and interpersonally effective workforce' (Parker, 1998, p. 462) and is hypothesized to be an indicator of employees' inclinations to proactively engage in organizational goal-related behaviours within jobs with broadly defined roles (Parker, 1998).

To date, research on RBSE has focused on scale development (e.g. internal consistency, distinctiveness from related constructs and confirmatory factor analysis, Parker, 1998) and on RBSE as an outcome variable (Parker, 1998; Parker and Sprigg, 1999; Parker, 2000). These studies have shown its reliability and uniqueness (Parker, 1998) and its usefulness in understanding the effects of proactive personalities (Parker and Sprigg, 1999); job enrichment, task control, and decision-making influence (Parker, 1998); and job autonomy and change receptiveness (Parker, 2000). So far, research on RBSE has not

explored its own predictiveness for outcomes related with the hypothesized behaviours (i.e. organizational goal-related, proactive, interpersonal and integrative tasks beyond the job's technical requirements), but, given the self-directed, flexible and interpersonal nature of the behaviour at hand, knowledge sharing, we hypothesize RBSE as one of the determinants of individual engagement in knowledge sharing.

Hypothesis 5: Individuals with high levels of RBSE will be more likely to engage in knowledge sharing.

Organizational environment and knowledge sharing

Job autonomy

According to Hackman and Oldham's job characteristics model (1976), the more autonomy a job allows – the more freedom the job grants jobholders to choose when, where, and how to do the job – the more responsible jobholders will feel for their work outcomes. A significant amount of research has been devoted to studying job autonomy and its relationship to important job outcomes, including job performance. For the most part, this research has employed measures from either the job diagnostic survey (JDS; Hackman and Oldham, 1975) or the job characteristics inventory (JCI; Sims and Szilagyi, 1976). A meta-analysis conducted for these two measures found an average corrected correlation between job autonomy and job performance of 0.18 and 0.21 respectively (Fried, 1991).

There are several reasons to believe that job autonomy may also be related to people's participation in knowledge sharing. First, it is possible that the inclination of an individual to share knowledge with others be related to the degree of responsibility that is felt by the individual for his or her work. Employees who feel a high level of responsibility may search for more efficient ways to do their job, and one way to do so is to share ideas and experiences with other employees. Given the documented link between job autonomy and felt responsibility (Hackman and Oldham, 1976) we expect job autonomy to have a positive impact on participation in knowledge sharing. Second, by its very nature, job autonomy is associated with a lack of precise instructions and procedures on how the work must be done. Autonomous employees will see greater utility in searching for new and creative ways to do the job because they have more need and freedom to apply them than employees who receive very detailed directions.

Further evidence for the impact autonomy may have on knowledge sharing is provided by research on creativity. Amabile *et al.* (1996) found that higher scores on the freedom sub-scale (very similar, according to their definition, to the notion of job-autonomy) of the KEYS instrument for measuring 'climate for creativity' correlated significantly with higher levels of creativity in work projects where creativity was possible and desirable. These results are consistent with findings from other studies involving creativity and autonomy (Amabile and Gitomer, 1984). So, job autonomy may contribute to knowledge sharing by encouraging the generation of new ideas that can potentially be shared.

Hypothesis 6: Individuals enjoying high job autonomy will be more likely to engage in knowledge sharing, especially knowledge seeking.

Rewards

According to expectancy theory (Vroom, 1964), intentions to perform a certain action are in part determined by consequence expectations. The more positive outcomes are perceived by a person to be associated with a given action, the more inclined the person will be to perform that action. Therefore, sharing knowledge may be in part determined by

the rewards an employee perceives are associated with such behaviour. Perceived rewards have been shown to have a significant effect on many work behaviours. Particularly interesting here, rewards appear to be related to behaviours that fall outside the immediate duties of a job such as voluntary training and organizational citizenship behaviour.

There is evidence showing that people are more likely to pursue voluntary training and development activities when they believe that receiving training will result in rewards such as future chances for interesting and stimulating work, raises, promotions and other rewards (Maurer and Tarulli, 1994; Noe and Wilk, 1993). Maurer and Tarulli (1994) found consistent links between perceived extrinsic rewards (e.g. better pay, promotion, or other tangible rewards) and perceived psychosocial incentives (e.g. becoming more well-rounded people or reaching their full potential as people inside and outside of work) with voluntary development. In addition, Maurer and Tarulli (1994) found an interaction between intrinsic outcomes and the expressed value for those outcomes: the greater value expressed for an outcome the more stronger the positive link between the reward and voluntary participation.

If perceived rewards predict the likelihood of a person voluntarily seeking training and development opportunities, it is very likely that they also predict the likelihood of a person voluntarily seeking information and ideas from co-workers, one of the major components of the knowledge sharing behaviour we are investigating.

To understand how rewards may affect whether an employee will provide ideas and insight to others – a second major component of knowledge sharing – we can look more closely at the research on prosocial behaviour. McNeely and Meglino (1994) define three types of prosocial organizational behaviour: prosocial behaviour directed at the organization, prosocial behaviour directed at individuals and role-prescribed prosocial behaviour. They proposed that desired rewards from the organization would be related with the performance of prosocial behaviour directed at the organization. In support of this hypothesis, they found that higher degrees of perceived reward equity and recognition for desirable behaviour were linked to increased performance of prosocial organizational behaviour, but not to prosocial individual behaviour. The concept of prosocial organizational behaviour directed at the organization (McNeely and Meglino, 1994) fits well with our interpretation of knowledge sharing because it focuses on voluntary organizational behaviours (not simply exchanging favours with individuals) in the pursuit of improved organization performance.

The literature on voluntary training and development and prosocial behaviour gives insight into the probable effects of rewards on knowledge management behaviours. Specifically, it is hypothesized that when individuals perceive a link between knowledge sharing behaviours (both seeking and providing) and organizational rewards (e.g. career advancement, international visibility and interesting projects or activity assignments), they will be more inclined to participate in knowledge sharing activities. In addition, it is hypothesized that when individuals believe that there is a link between knowledge sharing behaviours and intrinsic rewards (e.g. reaching one's full personal and professional potential, feelings of pride when others use one's ideas, and feelings of accomplishment when learning from others), they will also be more inclined to participate in knowledge sharing activities.

Hypothesis 7: Individuals perceiving intrinsic rewards associated with knowledge sharing will be more likely to engage in knowledge sharing.

Hypothesis 8: Individuals perceiving extrinsic rewards associated with knowledge sharing will be more likely to engage in knowledge sharing.

Perceived supervisory and peer support

Research on attitudes has long established a link between normative beliefs and intentions to behave in a certain way. According to Azjen and Fishbein's theory of planned behaviour (Azjen and Fishbein, 1980), one of the determinants of an intention to perform an action is the *subjective norm* of the individual, that is, the perceived pressures from the immediate social environment towards the action. Subjective norms result from the people's normative beliefs and their individual motivation to comply with those beliefs. People will be more inclined to perform a certain behaviour if they feel that important referent individuals are likely to approve and even applaud such behaviour. In the context of specific behaviours at work, such as knowledge sharing, it is to be expected that similar effects take place, that is, that a person will be more inclined to exchange knowledge with others to the extent that approval from peers and supervisors is expected.

Research in the area has documented the effect of supervisory and peer support on creativity. Amabile *et al.* (1996) investigated the effects of both supervisory encouragement (i.e. supportive supervisors that value the contributions of others and are good role models) and work group support (i.e. open communication, openness to new ideas, trusting and helpful). In both cases, the authors found that higher scores on the sub-scales (i.e. supervisory encouragement and work group support) of the KEYS correlated with higher levels of creativity in work projects where creativity was possible and desirable.

A similar result has been found in studies of voluntary training and development (Leibowitz *et al.*, 1983) and the frequency of seeking such activities (Noe and Wilk, 1993). That is, the support from supervisors and peers communicates to employees that these discretionary activities are valuable, it thus influences positively employees' attitudes, perceptions, and their understanding of the activities and their value (Leibowitz *et al.*, 1983). Noe and Wilk (1993) found a positive relationship between social support from managers and peers towards development activity and measures of actual development activity such as number of courses taken, number of hours spent on development and planned future activities. In fact, the authors go as far as to say that 'the findings of studies regarding development activity that have been conducted to date unequivocally suggest that organizations need to take steps to ensure that managers and peers are supportive of development activity and alleviate working conditions that inadvertently punish employees who attend development activities'.

Based on these findings about the effect of supervisory and peer support on creative and discretionary behaviours, we expect to find a similar positive relationship in the case of participation in knowledge exchange behaviours.

Hypothesis 9: Individual perceptions of support from colleagues towards knowledge sharing will be correlated with knowledge sharing behaviour.

Knowledge management systems and knowledge sharing

Finally, knowledge sharing requires that certain tools be available to carry out the exchanges. The tools and systems that facilitate knowledge sharing in organizations are usually known as knowledge management systems (Davenport and Prusak, 1998; Davenport *et al.*, 1998). In the current study we included two measures related to knowledge management systems: availability and perceived quality of contents. The first one referred to how readily accessible each individual perceived knowledge management systems to be. No matter how motivated a person might be to provide others with new

ideas or to request advice from others, doing so will only be likely if the person perceives that appropriate knowledge management tools are available to support such exchanges. The question here is not what the top management says but what each person in the organization perceives. Availability perceptions are not just determined by whether knowledge management systems do in fact exist, but also by how well it has been communicated to employees that they exist and what their purpose is, whether or not employees have been trained on how to use the systems, the degree of usability or user friendliness of the user interfaces, and on whatever practical difficulties may exist to access the necessary computer technology or communication connections. To analyse the effect of perceptions of systems availability, we formulated the following hypothesis:

Hypothesis 10: The more available people perceive knowledge management systems to be, the more inclined people will be to engage in knowledge sharing.

Even if a person feels that knowledge management systems are very easily available, the person may still find that the quality of the contents that are available are not worth the time necessary to explore the knowledge repositories (Cabrera and Cabrera, 2005). If a person is disappointed by the contents that are found, the person will be negatively rewarded and will very likely lose his or her interest in participating. Content quality should therefore have an impact on knowledge seeking. Knowledge providing may also be affected by the quality of the contents, by shaping perceptions on the importance and impact of contributions. If a person feels that the contents of a repository are exceptional, the person may be encouraged to contribute with his or her own ideas inasmuch as doing so contributes to project a positive personal image of expertise. These arguments yielded the following and final hypothesis:

Hypothesis 11: The better the perceptions about the quality of the contents found in the knowledge management systems, the more inclined users will be to engage in knowledge sharing.

Method

Participants

In order to test our hypotheses about individual engagement in knowledge sharing, we collected survey data from employees from a large multinational company in the area of information technology, systems and services. The company currently employs about 300,000 people worldwide, out of which 60–70 per cent are college graduates. Virtually every employee in this organization has access to a personal computer as well as connections to the Internet, a corporate Intranet, and a multitude of shared databases. Selecting a company like this had the practical advantage of allowing us to distribute our survey and gather the data electronically thus drastically simplifying otherwise cumbersome procedures.

To avoid the complexities of multi-language surveys and the potential confounding effects of national culture on knowledge sharing behaviours, we decided to limit the study to one country only. For practical reasons, the country we chose was Spain. From a total staff of approximately 5,400 persons, a random sample of 775 employees was drawn. A *post-hoc* analysis of basic demographics (sex, tenure, functional area and managerial responsibility) showed no significant differences between the random sample and the whole employee population. From the 775 surveys that were sent out, 372 valid responses were received¹ (i.e. a 48 per cent response rate). Table 1 summarizes the

Table 1 *Demographics and response bias data*

Variable	Sent (%)	Replied (%)	χ^2
Sex			$\chi^2(1) = .13, p = .57$
Males	70	66	
Females	30	32	
(missing)		2	
Managerial responsibility			$\chi^2(1) = 41.04, p < .01$
Yes	9	28	
No	91%	70	
(missing)		2	
Department			$\chi^2(2) = 24.73, p < .01$
Services	64	62	
Sales	27	14	
Other	9	22	
(missing)		2	
Tenure			$\chi^2(7) = 10.55, p = .16$
Less than 1 year	1	2	
1–5 years	21	33	
6–10 years	13	8	
11–15 years	20	19	
16–20 years	6	5	
21–25 years	21	17	
26–30 years	12	11	
More than 30 years	5	6	
(missing)		1	

demographics of the final sample. Managers showed a higher response rate than non-managers ($\chi^2(1) = 41.04, p < .01$), and so did consultants and sales personnel with respect to others – mainly administrative or technical staff – ($\chi^2(2) = 24.73, p < .01$). On the contrary, no differential response rate was found with respect to sex ($\chi^2(1) = .13, p = .57$) nor tenure ($\chi^2(7) = 10.55, p = .16$).

Procedure

The survey was delivered electronically and participants' responses were gathered automatically. The entire survey, including instructions and items, was presented in Spanish. The survey included 42-items plus six demographic questions.

The survey was preceded by a greeting from the Director of Human Resources, which included a brief explanation of the project, described the survey and gave instructions on completing and returning the survey. The survey was designed using advanced electronic mail functions that allowed participants to register their responses directly onto the form that then fed a database. It was explained that participation was completely voluntary and that all data would remain anonymous. The survey was administered in the spring of 2000 with all participants receiving it on the same Monday morning. A response deadline of two work weeks was given. The first Friday after the first communication, a reminder from the HR Director was sent.

Measures

Organizational commitment was assessed using four items from the internalization factor of O'Reilly and Chatman's (1986) organizational commitment scale. These items were on

a five-point Likert-type scale from 1 ('totally disagree') to 5 ('totally agree'). Sample items included: 'If the values of [the organization] were different, I would not be as attached to this organization' and 'The reason I prefer this organization to others is because of what it stands for, its values'. The aggregate scale showed a reliability (Cronbach α) of .89 (Table 2 summarizes, means, *SDs* and alphas for all independent variables).

To measure RBSE, we employed a five-item scale from Parker (1998). Sample items included 'I feel confident making suggestions to management about the way to improve the working of my section' or 'I feel confident presenting information to a group of colleagues'. Reliability of the scale was .76.

Four items were used to measure each of the three personality dimensions – agreeableness, openness to experience and conscientiousness. All items used bipolar scales where respondents were supposed to characterize themselves by marking one of the five points between two opposed adjectives. Items for agreeableness included 'Untrusting vs. trusting' and 'Non-cooperative vs. cooperative'. The openness to experience scale included items such as 'Non-creative vs. creative' and 'Unimaginative vs. imaginative'. Conscientiousness was assessed with paired adjectives such as 'Disorganized vs. organized' or 'Careless vs. careful'. These adjectives were adapted from Goldberg's (1990, 1992) big five adjective markers. The alphas were .61 for the agreeableness scale, .69 for openness to experience and .75 for conscientiousness.

Perceived support from supervisors and co-workers was assessed with a three Likert-type item scale adapted from Maurer and Tarulli (1994). Sample items included 'After completing a project or significant milestone, my supervisor and colleagues encourage me to make my ideas and experiences available to other people at [this company]' or 'The people I work with believe that exchanging ideas and experiences within [the company] is very important'. The scale yielded a reliability of .76.

The assessment of perceptions of rewards associated with sharing knowledge covered both extrinsic outcomes (promotions, gaining international visibility, being assigned to interesting tasks) and intrinsic outcomes (reaching one's full personal and professional potential, finding it rewarding when others use one's ideas or when one applies new ideas). Three items (also adapted from Maurer and Tarulli, 1994) were employed for each of the reward types. The internal consistency of the scale was .78 for intrinsic rewards and .80 for extrinsic rewards.

Job autonomy was measured with the three items from the job diagnostic survey (Hackman and Oldham, 1976), and showed an α of .71. One sample item was 'My job permits me to decide on my own how to go about doing the work'.

Three new items were developed to assess perceived availability of knowledge exchange systems. One such item was 'When I come up with a new idea or have an interesting experience I do not know how to make it available to the people at [the organization] who would be most interested in it' (reversed coded). The aggregate scale had an α of .74. Similarly, three items (e.g. 'The information that is available from internal sources at [this organization] is of the highest quality') were used to assess perceptions of content quality. The resulting scale had an internal consistency of .70 (see Table 3 for the factor analysis results for these scales).

The dependent variable was a self-report including two types of knowledge sharing behaviour: seeking and providing knowledge. Eight Likert-type items (four items per type of behaviour) were developed, two of which were reversed coded (one per type of behaviour). Sample items for the seeking knowledge scale are 'I try to stay updated by exploring all the information I can find through the information systems that I have available' or 'I often publish requests for advice and information that can help me in my work'. For the providing knowledge scale, items included 'Anytime I have valuable

Table 3 Factor analysis of newly developed scales: perceived availability, perceived of content quality and knowledge sharing behaviour

Factor	Variable	1	2	3	4	5
Factor 1 (mixed sharing)	Seeking3	0.818	0.233	-0.007	0.029	-0.050
	Seeking2	0.680	0.011	0.235	0.007	0.286
	Giving3	0.672	0.320	-0.030	0.188	-0.017
	Seeking1	0.652	-0.073	0.238	0.128	0.245
Factor 2 (availability)	Available1	0.077	0.800	0.181	0.056	0.041
	Available2	0.119	0.791	0.097	0.098	0.144
	Available3	0.159	0.697	0.294	0.016	-0.039
Factor 3 (quality)	Quality2	0.004	0.117	0.824	0.152	0.085
	Quality1	0.124	0.274	0.746	-0.063	0.125
	Quality3	0.225	0.211	0.636	0.170	-0.183
Factor 4 (mixed sharing)	Giving1	0.243	0.108	0.062	0.786	0.026
	Giving2	-0.011	0.036	0.122	0.780	0.105
Factor 5 (mixed sharing)	Giving4		0.070	-0.068	0.210	0.801
	Seeking4	0.379	0.125	0.154	-0.092	0.723

Results of principal components factor analysis with varimax rotation.

information related to my work, I do whatever is in my hand to make it available to other people who I think could be interested' or 'I participate actively in one or several forums or workgroups within [the organization] providing my ideas and helping others find solutions to their problems. Internal consistency for the whole scale was .73.

In addition to the hypothesized relationships to general knowledge sharing, the authors were prepared to do additional exploratory analysis on the dependent variable as two separate subscales created by dividing the items that were used to measure overall knowledge sharing behaviour into items relating to either knowledge giving or knowledge seeking. However, as shown in Table 3, the factor analysis of the dependent variable did not support dividing the dependent variable into the two proposed subscales. No further analysis using the subscales will be reported.

Results

We began by analysing the relationship between the demographics data with the independent and dependent variables (see Table 4). Altogether, the demographic variables accounted for 5 per cent of the variance of knowledge sharing ($p < .01$).

In order to test the relationships between the person, environment and system variables with knowledge sharing, we ran a series of analyses. First, we calculated the zero-order correlations of each variable with knowledge sharing. Next, we calculated two separate partial correlations for each variable. The first partial correlation is the relationship between the independent variable and the dependent variable controlling for the demographics and the other variables within the same set as the given variable (i.e. person, environment, or system variables). The second partial correlation reflects the same relationship controlling for demographics and all the other ten independent

Table 4 *Intercorrelations between the biographical variables and the independent and dependent variables*

Variable	1	2	3	4	5	A	B	C
Biographical data								
1 Mgt responsibility	—	-.11*	-.01	-.17**	.08	.05	-.03	.11*
2 Sex		—	.19**	.08	-.18**	.06	-.03	.11*
3 Tenure			—	.46**	.22**	.22**	.20**	.18**
4 Rotation				—	.07	.17**	.18**	.11*
5 Department					—	.10	.13*	.06

A = Knowledge sharing. B = Knowledge giving. C = Knowledge seeking. * $p < .05$; ** $p < .01$.

variables (i.e. person, environment *and* system variables). Due to the intercorrelation of some of variables (see Table 2), this process of successive addition of control variables is akin to increasingly conservative measures of the relationships (Maurer and Tarulli, 1994). This procedure was applied to all of the following analyses where appropriate.

In addition, we calculated the relationship between each set of variables (i.e. the five person, the four environment or the two system variables) with knowledge sharing. Similar to individual variables, we first controlled for the demographic data only and then we controlled for the demographic data and the variables from the other two variable sets. Finally, we used regression analyses to find the relationship of all the independent variables with knowledge sharing behaviour.

As Table 5 shows, all three sets of variables added significantly to the prediction of knowledge sharing. However, it is the set of person variables that has the strongest and most consistent relationship.

Within the person variables, consistent with hypotheses 1–5, all variables had a significant positive relationship with knowledge sharing (zero-order correlation). When demographics and all four of the other variables within the set were controlled for, only self-efficacy, organizational commitment and openness to experience remained significant (see partial correlations labelled r^a in Table 5). Finally when the rest of independent variables were also controlled for, only self-efficacy and openness to experience remained significant (partial correlations labelled r^b in Table 5).

Supporting hypotheses 6–9, all four of the organizational environment variables yielded a positive significant relationship with knowledge sharing. When controlling for demographics and variables within the same set, only perceived support and extrinsic rewards remained significant. Then, when the rest of independent variables were also controlled for, only perceived support accounted for additional significant variance.

Finally, within the system variables, both the availability and quality of the systems were significantly related to knowledge sharing, thus supporting hypotheses 10 and 11. However, the significance of these relationships dissipated when the demographics and the other independent variables were controlled for.

Discussion and implications

Summary of findings and implications

Our study shows how differences in self-reports of participation in knowledge sharing are significantly related to psychological variables, perceptions of the organizational environment and perceptions of knowledge management systems. From those three blocks of factors, psychological measures accounted for the largest share of variance.

Table 5 Results of regression and correlational analyses for relationships of person, environment and system variables with knowledge management behaviour variable

Variable	Zero order <i>r</i>	Partial		Overall		Total model <i>R</i> ^e
		<i>r</i> ^a	<i>r</i> ^b	<i>R</i> ^c	<i>R</i> ^d	
Person				.45**	.31**	.55**
1 Self-efficacy	.31**	.24**	.21**			
2 Org. commitment	.31**	.25**	.07			
3 Agreeableness	.15**	.00	-.05			
4 Conscientiousness	.18**	.07	.03			
5 Open. to exper.	.26**	.20**	.22**			
Environment				.38**	.17**	
6 Perceived support	.35**	.23**	.13*			
7 Extrinsic rewards	.17**	.12*	.02			
8 Intrinsic rewards	.18**	.09	.08			
9 Job autonomy	.20**	.09	.07			
System				.36**	.11**	
10 Availability	.35**	.22**	.08			
11 Quality	.33**	.20**	.09			

^aControlling for demographic variables and other variables within the same set. ^bControlling for demographic variables and all other 10 person, environment and system variables. ^cFor all variables within a set controlling for demographic variables. ^dFor all variables within a set controlling for biographical variables and other sets. ^eAdjusted *R* for all variables including demographic variables and all 11 person environment and system variables.

p* < .05; *p* < .01.

Among the psychological variables, self-efficacy and openness to experience were the most salient variables. Organizational commitment also predicted knowledge sharing, but its independent contribution dissipated when other organizational and system variables were included in the analysis. Among the organizational variables, the most important effect had to do with normative pressures, that is, perceptions of support from colleagues and supervisors towards knowledge sharing. Extrinsic rewards accounted also for some of the variance, but its contribution did not stand out when other factors were added. Finally, perceptions of availability of systems and quality of contents accounted for some of the variance in knowledge sharing, but the size of the effect was smaller than any of the other two blocks of variables.

As more and more money gets invested in the development of information systems for knowledge management (KPMG, 2000), our study pinpoints some important human and organizational factors that need to be considered for those initiatives to have any impact on knowledge sharing.

Our results showed a strong relationship between role-breadth self-efficacy and self-reports of knowledge management behaviour, even after controlling for every variable under study. It seems that a sense of personal competence and confidence may be a requirement for a person to engage in knowledge exchanges. Prior work on role-breadth self-efficacy (Parker, 1998) has identified several ways to enhance employees' self-efficacy. Building a highly self-efficacious staff begins by recruiting and selecting employees that are proactive, have high cognitive aptitude, have a high self-esteem and are intrinsically motivated. In addition, there are several interventions that could help develop the self-efficacy of existing employees. It appears that a rich two-way

communication between the employee and the organization – informing employees but also listening to them and even encouraging them to speak – positively contributes to employee self-efficacy (Parker, 1998). This kind of practice may also be instrumental in order to create the type of supportive environment that, according to our data, is so important to foster knowledge sharing.

Self-efficacy may also be affected by work designs that enhance autonomy and participation in decision making. Parker (1998) reports some evidence showing a positive link between job enrichment and role-breadth self-efficacy. Job enrichment creates a sense of control over the work environment, motivates people to exercise their full potential and thus offers more opportunities for employees to experience success, thus validating perceptions of personal efficacy (Gist and Mitchell, 1992; Bandura *et al.*, 1977). Our data did not show an independent, direct effect of autonomy – a proxy for job-enrichment – on overall knowledge sharing but it did show a significant correlation between autonomy and self-efficacy, in line with Parker's findings, as well as with perceptions of rewards. So autonomy may have an indirect impact on knowledge sharing.

Specific types of training could also contribute to building employee's self-efficacy. Whereas Parker (1998) found no significant effects of training on role-breadth self-efficacy, Gist (1989) found that some training techniques such as cognitive modelling and practice on innovative problem solving techniques had a positive impact on self-efficacy and measures of idea generation.

The relationship between openness to experience and knowledge sharing behaviour may also be relevant for selection purposes. While it is known that conscientiousness has a remarkable capacity to predict performance in a variety of work settings (Salgado, 2000), our data suggest that conscientiousness is not related to knowledge sharing. Organizations willing to promote a high level of knowledge exchanges may need to screen applicants for openness to experience. In addition to knowledge sharing, openness to experience has also shown relationships with other important work outcomes, such as the capacity to cope with change (Judge *et al.*, 1999b), which makes it even more interesting as a criterion for selection processes.

Our findings around organizational commitment are somewhat puzzling. While there is a significant and positive relationship between commitment and knowledge sharing, the effect is washed out once other organizational variables are entered into the model. This finding contradicts prior accounts that attributed commitment a key role in knowledge sharing (Kalman, 1999). It is possible that organizational commitment contributes to knowledge sharing by improving people's perceptions about the organization, the support they receive from it, as well as the quality of the information they normally get from it. In any case, our findings raise some doubts that will perhaps encourage further investigation.

The impact of social support on knowledge sharing appeared quite clearly in our data. People who perceive their co-workers and supervisors to value knowledge sharing feel more inclined to engage in such behaviour. This finding underlines the importance that top-management commitment may have in the implementation of knowledge management systems. Top management can send strong messages to the organization as to how important sharing knowledge is. These messages can be direct or indirect, through modelling, rewards and recognition.

Rewards, *per se*, had a moderate direct effect on knowledge sharing. It is possible, as discussed above, that the effect of rewards is also indirect, since rewards may help set up a supportive environment with respect to knowledge sharing. Rewards do not need to be monetary. In fact, our measures of rewards (even those of extrinsic rewards)

made no reference to monetary incentives. Aligning rewards with knowledge sharing may require HR to revise performance appraisal instruments, job assignment and career policies.

Finally, we found systems-related variables, such as perceived availability and perceived quality, to be the least relevant factors predicting knowledge sharing behaviour. This is an interesting finding, given the disproportionate effort that organizations currently seem to dedicate to the development or acquisition of knowledge management information systems (KPMG, 2000). Obviously, knowledge sharing requires appropriate communication channels, but the communication systems themselves cannot do it all. Knowledge sharing is a complex behaviour that is affected by a variety of psychological and organizational factors, and it is only by appropriately managing those factors that knowledge will actually flow through the organization.

Methodological issues and suggestions for further research

Our study may be limited by the common method variance problems that affect any research of this nature. Unfortunately, the research setting we used made it difficult to obtain objective measures of knowledge sharing behaviour without threatening the anonymity of the participants. Future research should try to somehow overcome this limitation.

Our sample is restricted to one country and one sector – actually one company – and, consequently it does not provide a basis for testing the generalizability of the findings. Future research conducted in other industries and national environments would provide interesting and complementary information.

Our focus was restricted to knowledge sharing, just one of the processes involved in the broader concept of knowledge management in organizations. Managing the intellectual capital of an organization entails much more than exchanging ideas. For the exchanges to provide any value, employees must somehow manage to produce a great deal of novel and valuable ideas to be exchanged. Also, employees need to be able to apply novel ideas to current work and projects. Our study does not provide insight into those issues. There is a clear need to evaluate how the findings reported here link with current research on creativity and organizational learning and to identify the gaps that will require specific investigation.

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Note

- 1 There were actually 376 responses but four of them were discarded due to technical problems with the retrieval of their content.

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